Role of 64-scan CT in the detection of pancreatic fistula (PF) after pancreatoduodenectomy

Poster No.: C-1068
Congress: ECR 2011
Type: Scientific Paper
Authors: M. C. Gibertini, A. Pecchi, M. De Santis, G. Della Casa, F. Di Benedetto, P. Torricelli; Modena/IT
Keywords: Abdomen, Gastrointestinal tract, Pancreas, CT, Computer Applications-Detection, diagnosis, Fistula
DOI: 10.1594/ecr2011/C-1068

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR’s endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Pancreatoduodenectomy is a complex and high risk procedure, primarily indicated for two conditions: tumour in the periampullary region (cancer in the head of pancreas, the ampulla of Vater, the distal bile duct, and the duodenum) and chronic pancreatitis involving the head and uncinate process of the pancreas.

Nowadays the mortality associated with this procedure accounts up for 3-5%, whereas the morbidity rate still remains high (30%-50%).

Postoperative pancreatic fistula (PF) is the most common major complication after pancreatoduodenectomy, with reported rates ranging from 2% to more than 20%.

PF is related to the breakdown of the pancreatic anastomoses: any of the anastomoses can fail, but the pancreaticoenterostomy is probably the most important one because of the potential leakage of pancreatic secretions into the abdomen. This complication tends to be more common with small ampullary tumours that have not yet obstructed the pancreatic duct.

PF represents a potentially serious and life-threatening event often associated with abdominal collections, abscesses, sepsis, and hemorrhage, with the necessity of reintervention, extended hospitalization, and postoperative mortality in 40% of cases with complications. Despite its importance, PF has still not been uniformly defined.

A diagnosis of PF should be suspected on the basis of clinical and biochemical parameters such as the timing of development, the daily drain output, the amylase content, and the duration of the complication.

Recently, the International Study Group on Pancreatic Fistula (ISGPF) established that a PF should satisfy the following criteria: "output through an operatively placed drain or a subsequently placed percutaneous drain, of any measurable volume of drain fluid on or after postoperative day 3, with an amylase content greater than three times the upper normal serum value". Three different grades of PF (grades A, B, C) are defined according to the clinical impact on the patient's hospital course. Grade A was defined as a 'transient fistula' where no specific treatment was necessary. Grade B was defined as a persistent high amylase drainage resulting in a change of management that included nutritional support and maintenance of adequate drainage. Grade C fistulas were similar to grade B, but major changes in clinical management were required.

Several studies suggest that radiologic evaluation is neither mandatory nor necessarily recommended for diagnosis, however computed tomography is the imaging modality of choice in the follow-up of patients who underwent pancreaticoduodenectomy, because of its rapidity of execution and high spatial resolution.
In the early postoperative period, CT is useful in detecting surgical complications such as anastomotic leakage, abscess and hematoma.

since it correctly defines the extension of abdominal fluid collections, CT represents an important tool to assess the management of PF (percutaneous drainage or surgical revision).

The aim of our study was to evaluate the role of 64-scan CT in the detection of PF after pancreatoduodenectomy.
Methods and Materials

Between September 2004 and September 2009, 63 patients (37 males, 26 females, mean age 64.5 years), underwent pancreatoduodenectomy at Liver and Multivisceral Transplant Center of Modena and Reggio Emilia University.

During postoperative period (from 2 to 69 days, mean 14.35 days), 25/63 patients with clinical suspicion of PF (abdominal pain, fever, leucocytosis and output through an operatively placed drain with amylase content greater than three times the normal serum value), were evaluated with 64-scan CT.

CT findings were compared with surgical abdominal drains amylase levels. Diagnosis of PF was made on the basis of CT findings of perianastomotic fluid collections in association with elevated amylase levels from surgically placed abdominal drains.

CT was performed by using 64-detector scanner (LightSpeed VCT; GE Medical Systems, Milwaukee, Wis), before and after administration of iodinated contrast agent. Additionally, 100 cc of diluted gastrografin was administered as oral gastrointestinal contrast agent 30±10 min before scanning to fill the proximal small bowel. The imaging field was set to extend from the diaphragm dome to symphysis pubis. When possible, patients were instructed to hold their breath during the helical scan.

A triphasic protocol with standard delays was used during the arterial (30 seconds after injection) and portal venous (60 seconds after injection) phases. Iomeprol (Iomeron; Bracco SpA, Milan, Italy) at 300 mg of iodine per milliliter or iodixanol (Visipaque; Amersham Health, Princeton, NJ) at 270 mg of iodine per milliliter was used as an intravenous contrast agent, with 2mL/kg injected at 3 mL/sec up to 200 mL. Contrast-enhanced-64-slice-CT protocol parameters were: section thickness 2.5 mm, collimation 2.5 mm, table pitch 1, 120 kV, noise index 15.54 with 120-500 mA. Reconstruction was performed with a standard algorithm, with reconstruction interval of 2.5 mm. Multiplanar and 3D reconstructions were also performed.

Twenty-five CT scans were assessed for the presence of a fluid collection with or without air bubbles near the surgical perianastomotic site (pancreaticojejunostomy or hepaticojejunostomy site), or around the pancreatic bed.

Diagnostic confirmation was obtained with ultrasound and subsequent percutaneous drainage of abdominal fluid collection (n=13), or by relaparotomy (n=5).

Sensitivity, specificity, positive and negative predictive values and accuracy of 64 scans-CT were respectively calculated.
Results

In 18/25 (72%) patients with clinical suspicion of PF and elevated output of amylase-rich fluid through an intraoperatively placed drain (> 3 times normal serum amylase level), CT showed abdominal perianastomotic fluid collection, with final diagnosis of PF.

In 9/18 patients, perianastomotic fluid collections were unhomogeneous because of the presence of air bubbles, whereas in 8/18 patients, fluid collections were uniformly hypoattenuating. One patient with CT evidence of a small homogeneous peripancreatic fluid collection and mild amylase drainage content was septic for hepatic abscess.

In 6/25 patients with clinical suspicion of PF, CT didn't show perianastomotic fluid collections: these patients underwent postoperative follow-up with US until the normalization of laboratory and clinical findings.

In one patient with severe and prolonged amylase drainage output, CT didn't show abnormalities. Sensibility, specificity, accuracy, positive, negative predictive value for CT were respectively 95%, 88%, 93% 95% and 88%.
Fig. 1 (A-D). 63 yr patient 10 days after pancreatoduodenectomy presented with poor clinical conditions (acute abdominal pain, fever, leucocytosis and elevated amylase drain content). 64 scans CT (A-D) revealed a large, unhomogeneous fluid collection with air component at the pancreaticoenterostomy site (red arrow). Surgical revision of the anastomosis was required.

Fig. 0

© Dipartimento di Diagnostica per Immagini e Radiologia Interventistica, Azienda Ospedaliero-Universitaria Policlinico di Modena - Modena/IT
Fig. 2 (A-D). 55-years-old patient undergone pancreatoduodenectomy. 15 days after surgical intervention, he had diffuse abdominal pain and elevation of amylase drain content. 64-scans CT (A-C) demonstrated homogeneous fluid collection at the hepatic hilum, cranially to the enteropancreatic anastomosis site (red arrow). US-guided percutaneous drainage was subsequently performed. (D)

Fig. 0

© Dipartimento di Diagnostica per Immagini e Radiologia Interventistica, Azienda Ospedaliero-Universitaria Policlinico di Modena - Modena/IT
Fig. 3 (A-E). 69-years old patient undergone pancreatoduodenectomy. During hospitalization, she suddenly became septic, in association with high fever and abdominal pain. Mild elevation of amylase drain level was present. 64-scan CT demonstrated a subdiaphragmatic hepatic abscess with air-fluid level (A-C, red arrow), and a small fluid collection close to the enteropancreatic anastomotic site (D, white arrow). The abscess was percutaneously drained with US-guide, with resolution of clinical conditions. (E).

Fig. 0

© Dipartimento di Diagnostica per Immagini e Radiologia Interventistica, Azienda Ospedaliero-Universitaria Policlinico di Modena - Modena/IT
Conclusion

Postoperative pancreatic fistula is the most important technique-related complication after PD, with reported rate ranging from 10 to 24%. PF after pancreatoduodenectomy significantly contributes to the development of other major abdominal complications and it is among the most common causes of perioperative morbidity and mortality, along with patient related co-morbidities. The early detection of PF as well as other postoperative complications is crucial. Radiology and in particular multidetector computed tomography (MDCT) studies have a critical role here. Transabdominal US represents the first-line radiological technique used in the immediate post-operative period, it can show intraabdominal collections or infected collections but it has several limitations: when intestinal or free intraperitoneal gas is present, the US depiction of abdominal and retroperitoneal fluid collections becomes difficult.

CT is the most effective imaging modality for evaluation of the pancreas after surgery: it allows detection of the normal aspects and postoperative complications (i.e. PF, abscess, intra-abdominal bleeding). Transient fluid collections often occur in the early postoperative period, usually in the surgical bed, Morrison's pouch, the right paracolic gutter, and at the anastomoses. At times, small air bubbles can be seen in these collections. Follow-up CT should be performed in patients who have a fluid collection with air bubbles in these areas, especially when the patient is symptomatic (leucocytosis, peritoneal irritability, or high fever).

In our series, 18/25 patients with clinical suspicion of PF and elevated output of amylase-rich fluid through an intraoperatively placed drain (> 3 times normal serum amylase level), had CT evidence of abdominal perianastomotic fluid collection, with final diagnosis of PF. Our data are in good agreement with other reports in literature.

In our study there was a good correlation between CT findings and amylase drain value: in patients with perianastomotic fluid collection with air component, mean amylase levels were higher than in patients with homogeneously hypoattenuating fluid collection. One patient with mild amylase drain value and small perianastomotic collection of fluid without air component presented with clinical instability and sepsis for hepatic abscess, which was percutaneously drained. In this case we found no relationship between clinical findings and postoperative amylase drain levels and CT features.

In 6 patients with clinical suspicion of PF and no pathological abdominal CT aspects, only follow-up was required until the normalization of clinical and biochemical findings.

Abdominal CT is a useful technique to evaluate patients with clinical symptoms of postsurgical complications after pancreatoduodenectomy.

Elevation of amylase drain levels, in addition with CT evidence of peripancreatic fluid collection and abdominal pain, fever, and/or leukocytosis, permit to diagnose PF.
Amylase drain output coupled with the grade of PF and abdominal CT extension and features of fluid collections: it can be assumed as a valid tool to select patients who need CT evaluation during postoperative period.

CT can be considered as a fast, panoramic and helpful radiological technique in the management of patients undergone pancreatoduodenectomy with clinical suspected PF.
References

c
Personal Information

M. C. Gibertini*, A. Pecchi*, M. De Santis*, G. Della Casa*, F. Di Benedetto ¹, P. Torricelli*;

* Dipartimento Integrato Servizi Diagnostici e per Immagine, Azienda Ospedaliero-Universitaria Policlinico di Modena, Via del Pozzo 71, 4100 Modena IT

¹ Centro Trapianti di Fegato e Mutiviscerale, Azienda Ospedaliero-Universitaria Policlinico di Modena, Via del Pozzo 71, 4100 Modena IT